Indian Institute of Space Science and Technology

Thiruvananthapuram

Details of Instructional and Research labs
under the
Department of Avionics

Contents

1 Advanced Microwave Lab

- **Floor area:** 110 Sq m
- **Overall capital expenditure:** 4 Crores
- **Major instruments/ equipments:**
  Simulation softwares: Ansys HFSS, CST, FEKO, ADS
  Fabrication Facility: Mechanical (Drilling and Milling) based PCB
  Measurement facility: VNA (Agilent PNA-X N5224A), Spectrum Analyzer, Signal Generator (Upto 40 GHz)
- **Objective of the lab:** This lab is equipped with state of the art facilities in frontier areas of microwave circuits and antennas across various electromagnetic spectrum and caters to the research activities of PhD and M.Tech. Students along with various other R&D projects. This lab caters to the various advanced research in diversified areas, like, advanced electromagnetics, antenna technology, microwave and mm-wave circuits, metamaterials, THz Technology, wireless power transfer, energy harvesting etc.

Figure 1: Glimpses of the selective major equipments and devises/antennas/system realized in Advanced Microwave Lab.

2 Advanced Wireless Communication Research Lab

- **Floor area:** 47 Sq m
- **Overall capital expenditure:**
- **Major instruments/ equipments:** Existing Hardware Tools:

- Universal Software Radio Peripheral Transceivers (USRP N210) (Carrier frequency up to 6GHz and bandwidth of 20 MHz)
- Daughter Cards (UBX 40, LFTX (DC-30MHz), LFRX (DC-30MHz))
- OCTOCLOCK-G (8-channel clock distribution module)
- GPS Antenna
- VERT400 Antenna (144MHz, 400MHz, 1200MHz)
- Log Periodic Antenna (400MHz-1GHz, 850 MHz-6.5GHz)
- ADALM PLUTO Analog Device SDR (325MHz-3.8GHz)
- PXB Baseband Generator and Channel Emulator N5106A
- EXA Spectrum Analyzer (26.5GHz)
- MXG Vector Signal Generator (6GHz)
- RF Development Tool-AD9364 Software Development Board (AD-FMCOMMS4-EBZ)
- Xilinx Zynq-7000 All Programmable ZC706 Evaluation SoC

Existing Software Tools:

- Matlab Software
- Agilent SystemVue Software
- Agilent VSA Software

- **Objective of the lab:** The Advanced Wireless Communication Laboratory specializes in cutting-edge research in wireless communications, emphasizing signal processing within the physical layer. Its primary research activities span several critical areas, including Signal Processing for Wireless Communication Systems, which focuses on enhancing the efficiency and performance of wireless networks. The lab also explores Cognitive Radio and Dynamic Resource Allocation, which aim to optimize the use of available spectrum. Additionally, the team works on Full-Duplex Radio and Hardware-Based Modeling and Signal Processing Techniques, seeking to enable simultaneous transmission and reception on the same frequency. Software Radio and USRP Experimental Implementation are also key areas of focus, facilitating flexible and reconfigurable communication systems. The lab's research in Hybrid Beamforming for mm Wave Communication aims to improve high-frequency communication capabilities, while their work on OFDM/OTFS Systems seeks to integrate radar and communication functions. Furthermore, the lab delves into MIMO OFDM Systems, focusing on Channel Estimation and Decoding, and advances in Radar Signal Processing to enhance the accuracy and reliability of radar systems.

3 Analog Electronics Circuits Lab

- **Floor area:** 115 sq m
- **Overall capital expenditure:**
- **Major instruments/ equipments:** The Analog Electronics Circuits Lab is well-equipped with a range of sophisticated generation and testing devices to support its educational and research objectives. Key equipment includes:

(1.) Digital Oscilloscopes: Digital oscilloscopes are crucial for observing the waveform of electronic signals. They allow students to measure voltage changes over time and analyze the behavior of analog circuits.

(2.) Power Supplies: Power supplies provide the necessary voltage and current to electronic circuits. Adjustable power supplies enable the variation of input conditions for different experiments.

(3.) Waveform Generators: Waveform generators produce various types of electronic signals, such as sine, square, and triangular waves. These signals are used as inputs for testing and analysis.

(4.) Multimeters: Multimeters are versatile instruments capable of measuring voltage, current, resistance, and sometimes other parameters like capacitance and frequency. They are essential for basic troubleshooting and verification of circuit parameters.

(5.) TI Analog Lab Experiment kit: Texas Instruments (TI) Analog Kit, providing students with a comprehensive suite of tools and components to explore and understand analog electronics. This kit includes a variety of essential devices such as operational amplifiers, transistors, resistors, capacitors, and integrated circuits, enabling students to design and implement a wide range of analog circuits.

- **Objective of the lab:** The Analog Electronics Circuits Lab equips undergraduate students with essential practical skills and technical knowledge through a series of hands-on experiments and design projects. Students learn to design DC circuits using transistors, applying various biasing techniques to ensure stable and predictable operation. They also gain expertise in designing amplifiers to meet specific performance criteria, such as gain and bandwidth, and develop the ability to measure and analyze the frequency response of these amplifiers using digital oscilloscopes and waveform generators. Furthermore, students design wave-shaping circuits, oscillators, and multivibrators using operational amplifiers and timer ICs like the 555 timer, acquiring a deep understanding of their principles and applications in signal processing. The lab also emphasizes the design of complete analog electronic systems, considering real-world component variations and temperature dependencies, thereby preparing students to tackle complex engineering challenges in their future careers.

4 Anechoic Chamber Facility

- **Floor area:** 150 sq m
- **Overall capital expenditure:** 1.5 Crores
- **Major instruments/ equipments:** Anechoic chamber with a frequency range of 800 MHz to 40 GHz
- **Objective of the lab:** RF and Microwave research group of the department of Avionics has been equipped with far-field anechoic chamber with a frequency range of 800 MHz to 40 GHz. The facility has a quite-zone of 1ft x 1ft x 1ft and is used to measure the normalized far-field radiation pattern of various antennas. The facility is extensively used for teaching and state of the research projects in the area of printed antennas, dielectric antennas, small satellites, metamaterial and metasurface, microwave wireless power transfer and energy harvesting.

Figure 2: Analog Electronics Circuits Lab.

5 ASIC Characterization Lab

- **Floor area:**
- **Overall capital expenditure:**
- **Major instruments/ equipments:** The following equipment have been procured and are being used: • Vector signal generator (44 GHz) – Rhode & Schwarz • Digital Storage Oscilloscope (6 GHz) – Keysight • NI Chassis with controller and multifunction IO card & FPGA – NI • Probes for wafer probing – GSG, GSSG up to 40 GHz & DC quadrant probes • Manual positioners on MPS150 wafer probe station (shared with Nano characterization lab) • Moku Go system: 2 channel signal generator + 2 channel oscilloscope • DC power supplies • Digital multimeters
- **Objective of the lab:** The ASIC Characterization Lab was established to facilitate the test and measurement of the ICs and the electronic systems developed by the research group. The lab is equipped with ESD flooring.

6 ASIC Design Lab

- **Floor area:**
- **Overall capital expenditure:**
- **Major instruments/ equipments:** Two workstations, four PCs, EDA tools for IC design such as the Cadence suite, Synopsys, Mentor graphics tools and ADS for electromagnetic simulations.

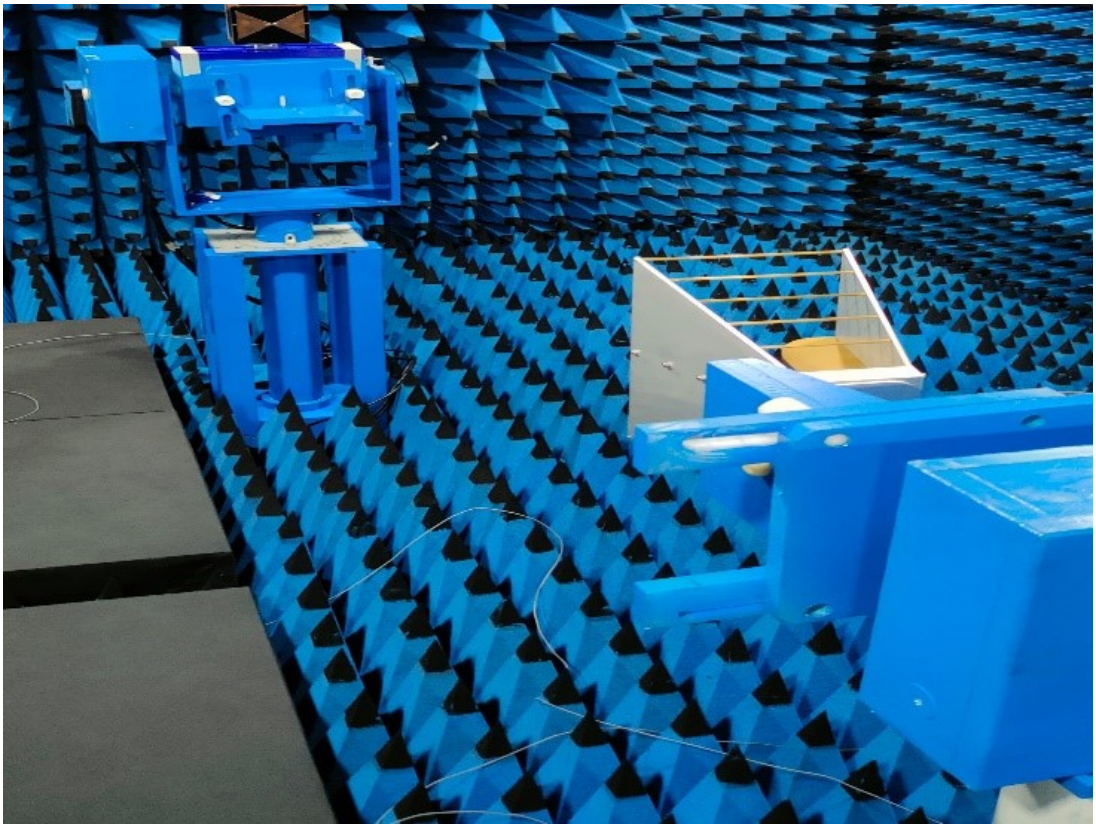

Figure 3: Anechoic Chamber Facility.

- **Objective of the lab:** facilitating the design and simulations of ASICs – in specific analog, mixed-signal and RF ICs.

  Recently, IIST was awarded with the licenses for these tools by Ministry of Electronics and Information Technology (MEITY), Government of India for a period of 5 years, starting April 2024.

7 Bio Sensor Lab

- **Floor area:** 25 sq m
- **Overall capital expenditure:** 50 lakh
- **Major instruments/ equipments:**

  1. Electrochemical Workstation: This multifunctional equipment (12 channel) is used to develop high sensitive bio sensor. However, the equipment is also used for nanomaterial synthesis.
  2. Optical Spectrometer:This equipment is mainly used to characterize the optical properties (UV-VIS) of grown materials for quick reference.
  3. Micro-Centrifuged system: High speed (1300rpm) micro centrifuge system for different purpose. The temperature of the system can be set from -4oC to 40oC.
  4. Refrigerators: Different refrigerators (-20oC, -4oC) are there for storing the samples.

Figure 4: ASIC Characterization Lab.

5. Western blotting Unit: It is having western blot unit for protein analysis. The up gradation process is going on to incorporate Digital X-ray reader.
6. Electrophoresis Unit:This unit is for Protein analysis.
7. General Purpose equipment: The facility is also having other general purpose small equipment like vortex, dancing Shaker, tube revolver, autoclave, Hotplate with magnetic stirrer etc.
8. RT-PCR : The facility is having 96 wall RT PCR system for DNA/RNA quantifications.
9. ELISA: The facility is having ELISA unit for protein Quantifications.

- **Objective of the lab:** Molecular profiling of liquid biopsies is now emerging as pivotal for cancer biomarker discovery. The low-invasive nature of the approach used for collecting biospecimens (i.e. blood, urine, saliva, etc.) may allow a widespread application of novel molecular diagnostics based on liquid biopsies. Liquid biopsies have the potential to help clinicians screen for disease, stratify patients to the best treatment and monitor treatment response and resistance mechanisms in the tumor. Nanoscale vesicles that originate from tumor cells and which

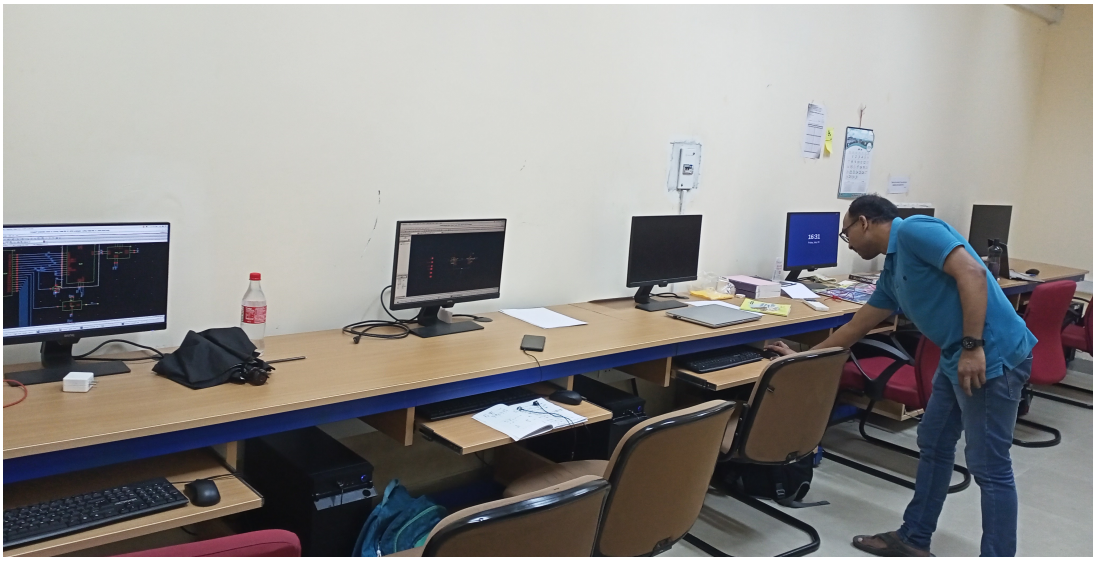

Figure 5: ASIC Design Lab.

can be found circulating in the blood (i.e. exosomes and microvesicles) have been discovered to contain a wealth of proteomic and genetic information to monitor cancer progression, metastasis, and drug efficacy. However, the use of exosomes and microvesicles as biomarkers to improve patient care has been limited by their small size ($30nm - 1\mu m$) and long time ($>$ 2 hr) sample preparation required for their isolation and measurement. Similarly an extensive research is necessary to identify the type of cancer and characterize the nano vesicles for cancer prognostic. The group has demonstrated an efficient isolation technique of exosome from human serum less than 60 min followed by detection of exosome derived Biomarkers in less than 10 min. Now an attempt is made to explore the possibility to conduct a field trial with 300 cancer (Lung, Pancreas and Ovarian) patients per year with Regional Cancer Centre (RCC).

Figure 6: Bio Sensor Lab.

8 ChemiSens Lab

- **Floor area:** 100 sq m

- **Overall capital expenditure:** 2.5 Crores
- **Major instruments/ equipments:**

1. Gas calibration facility (PPM): At the moment only two gases can be mixed. The facility is upgrading to multi-gas calibration facility with ten input gases. The mixing chamber/calibration chamber can be operated at different temperatures and vacuum.
2. Gas calibration facility (PPT): The lab is also equipped with dedicated gas mixing set up which can generate ppt level gases. The system is having the facility to calibrate the sensor at different temperature (up to 400oC). Here the sensor is probed with four manipulator for rapid prototyping.
3. Multipurpose Chamber: To support a critical requirement to calibrate gas sensors at wide temperature range (77K to 873K), the facility is having a special purpose chamber for the above mentioned purpose. The same chamber is also used to annealed the samples at different gas atmosphere.
4. Microwave assisted nano-material synthesis system: This multi-functional equipment is mainly for synthesizing nano-materials for gas and bio sensors.
5. Electrochemical Workstation: This multifunctional equipment (12 channel) is used to develop high sensitive bio sensor. However, the equipment is also used for nanomaterial synthesis.
6. Optical Spectrometer:This equipment is mainly used to characterize the optical properties (UV-VIS) of grown materials for quick reference.
7. Micro-Centrifuged system: High speed (1300rpm) micro centrifuge system for different purpose. The temperature of the system can be set from -4oC to 40oC.
8. Spin Coating Unit: A UV coupled spin coating unit is used for nano materials synthesis and polymer curing.
9. Refrigerators: Different refrigerators (-20oC, -4oC) are there for storing the samples.
10. Electrophoresis Unit:This unit is for Protein analysis.
11. General Purpose equipment: The facility is also having other general purpose small equipment like vortex, dancing Shaker, tube revolver, autoclave, Hotplate with magnetic stirrer etc.

- **Objective of the lab:**

(1) Low power and low cost Fuel leak detection (H2, CH4,O2, NO2 etc) system

(2) Gas sensors array to monitor critical gases in crew module for Human Space Mission.

(3) Low power and Low cost online Pollution monitoring system.

(4) Low power and low cost Green House Gas emission system from agriculture soil

(5) Low power and low cost Exhale breathe analyzer for Cardio Vascular Diseases, respiratory and Gut Infections.

9 Communication Networks Lab

- **Floor area:** 21 sq m
- **Overall capital expenditure:** 25 Lakhs

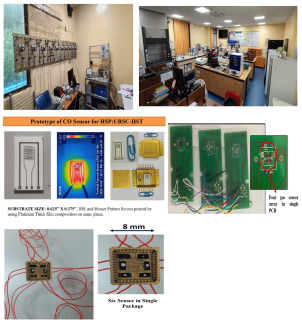

Figure 7: ChemiSens Lab.

- **Major instruments/ equipments:** Desktop and laptop computer, wireless sensor motes, software defined radio
- **Objective of the lab:** The lab focuses on mathematical performance analysis, optimization, and design of sequential communication and computing algorithms.

Figure 8: Communication Networks Lab.

10 Control and Guidance Lab

- **Floor area:** 120 sq m
- **Overall capital expenditure:** 100 Lakh
- **Major instruments/ equipments:**
  (1) Magnetic levitation systems
  (2) Inverted pendulum
  (3) Characteristic of PID
  (4) Active mass spring system
  (5) TRMS
  (6) Precision servo
  (7) Torque control (rotary)
  (8) Mass spring control (linear)
  (9) Double inverted pendulum
  (10) Double magnetic levitation
  (11) Mechanical gyro control
  (12) Couple tank systems
  (13) LVDT actuator control
  (14) Qbot
  (15) Q ball
  (16) Hexapod
- **Objective of the lab:** The Control Systems Lab for undergraduate, postgraduate, and PhD students at the Department of Avionics is equipped with a diverse array of sophisticated systems, including a magnetic levitation system, twin rotor MIMO system, servo system, coupled tank system, and a range of advanced Quanser setups such as the pendulum, quarter car model, 3-DOF gyroscope and hexapod. Additionally, it features a pendulum on a cart, a mass-spring-damper system, and a quadcopter. The lab's primary objective is to provide students with hands-on experience in the system modeling, design, analysis, and implementation of control systems. By engaging with these state-of-the-art setups, students can deepen their understanding of dynamic systems, control theory, and real-time feedback mechanisms.

11 Digital Communication System Lab

- **Floor area:** 93 sq m
- **Overall capital expenditure:**
- **Major instruments/ equipments:** The Digital Communication Lab is well-equipped with a range of sophisticated generation and testing devices to support its educational and research objectives. Key equipment includes:

- Spectrum Analyzer (9kHz - 18GHz): This device is crucial for analyzing the frequency spectrum of signals, allowing for detailed examination of signal components and interference.
- Vector Signal Generator (9kHz – 3.2GHz): Used for generating complex signal waveforms and modulated signals, it supports various modulation schemes essential for both UG and PG student experiments.
- Signal Generator (9kHz – 3.2GHz): Provides a stable signal source for testing and calibrating communication systems and circuits.
- Signal Analyzer (9kHz – 3.6GHz): Essential for analyzing and measuring the characteristics of received signals to ensure they meet desired specifications.
- Network Analyzer (9kHz – 3.2GHz): Used for evaluating the performance and parameters of communication networks, including impedance, reflection, and transmission characteristics.
- Ground Penetrating Radar (GPR): is a non-invasive geophysical method used to explore and map subsurface structures. It involves transmitting high-frequency electromagnetic waves into the ground and analyzing the reflected signals to detect and characterize buried objects or features.
- SDR ad USRP: Software-Defined Radio (SDR) and Universal Software Radio Peripheral (USRP) are integral components in modern wireless communication research and experimentation.
- **NI Emona DATEx** (Data Acquisition and Test Equipment) is a versatile data acquisition and signal analysis tool developed by Emona Instruments, often used in conjunction with National Instruments (NI) hardware. DATEx systems are used in *R&D* environments to test and evaluate communication systems, signal processing algorithms, and electronic circuits.

  These devices enable comprehensive exploration of modulation and demodulation techniques, as well as advanced studies in 4G communication systems, thereby enriching the lab's research and educational programs.

- **Objective of the lab:** The major objectives of the Digital Communication Lab are to provide students with a comprehensive understanding of fundamental and advanced communication concepts through hands-on experimentation. For undergraduate students, the lab aims to impart practical knowledge of modulation and demodulation techniques using kits and breadboards, bridging the gap between theory and practice. For postgraduate students, the focus is on exploring and analyzing advanced 4G communication systems and other modern technologies. The lab also seeks to develop practical skills in designing, implementing, and testing communication systems using sophisticated tools and software such as MATLAB, Python, and SDR/USRP. Expected outcomes include enhanced understanding of communication principles, proficiency in advanced tools and technologies, valuable research contributions in signal processing and radar systems, and practical experience that prepares students for careers in the communications field.

12 Digital Electronics and Microprocessor Lab

- **Floor area:** 93 sq m

Figure 9: Digital Communication System Lab.

- **Overall capital expenditure:** 40 Lakhs
- **Major instruments/ equipments:**
  (1) Digital Trainer Kits
  (2) Microprocessors, Microcontroller evaluation Boards with Peripherals
  (3) Desktop PCS
- **Objective of the lab:** Digital and Microprocessor Lab is developed for UG, and PC to carry out hands on experiments in Digital circuits and to learn C programs to be program in microprocessor/microcontroller boards to get knowledge in microprocessor/microcontroller architecture, programming and its applications.

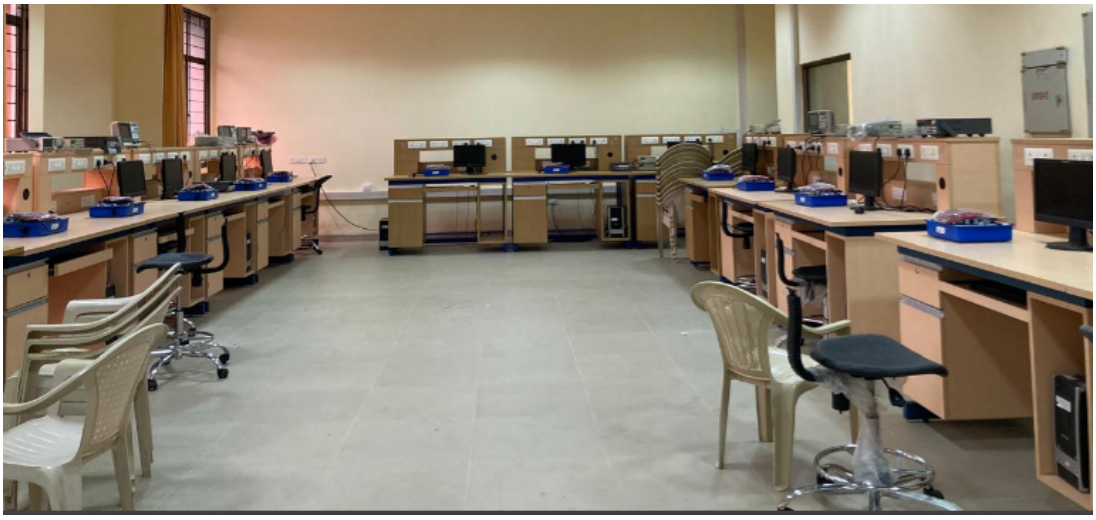

Figure 10: Digital Electronics and Microprocessor Lab.

13 Digital Signal processing Lab

- **Floor area:** 96 sq m
- **Overall capital expenditure:** 1 Crore
- **Major instruments/ equipments:**
  (1) DSP Boards and related software

(2) FPGA boards and related software

(3) CRO/Signal Generators

(4) MATLAB

(5) Jetson Nano Boards and related software

(6) Desktop computers

- **Objective of the lab:** Digital Signal Processing Lab is developed for UG, PG and Research Students to carry out experiments in 1D/2D signal processing to perform both simulation and real time signal processing task.

14 DSP VLSI Research Lab

- **Floor area:** 46 sqm
- **Overall capital expenditure:** 85 Lakhs
- **Major instruments/ equipments:** Analog and Digital IC design Tools from Cadence, Synopsys, Mentor Graphics, FPGA design tools and boards, MEMS software, Logic Analyzer, High end PCs.
- **Objective of the lab:** This lab established to support the Post Graduate programme VLSI and Microsystems introduced in the year 2013 and research activities in the areas of VLSI.

15 ECAD Lab

- **Floor area:** 75 sq m
- **Overall capital expenditure:** 40 Lakhs
- **Major instruments/ equipments:** Software related to CAD /IDE design tools and Network design tools, Desktop computers FPGA boards for signal processing applications
- **Objective of the lab:** E-CAD lab in the department that deals with computed aided design of various analog circuit and digital circuits, PCB design tools, Network design tools and simulation software such as MATLAB. Students are familiarized with various state of the art software packages required for basic and advanced circuit design.

16 Image Processing and Computer Vision Lab

- **Floor area:**
- **Overall capital expenditure:**
- **Major instruments/ equipments:**
- **Objective of the lab:**

17 Instrumentation and Measurement Lab

- **Floor area:** 92 sq m
- **Overall capital expenditure:**
- **Major instruments/ equipments:** Core Research Activities on Measurement Electronics and Instrumentation include: Low-current measurement for retarding potential analyzer, Reluctance-Hall effect-based instrumentation system for through-shaft angle sensing, Digital Interfacing Front-ends for Resistive and Capacitive Sensors, Biomedical electronic circuits.
- **Objective of the lab:** Instrumentation and Measurement Laboratory, housed at Avionics Department of IIST, is well equipped for research and education in the field of sensors and associated measurement schemes, analog signal processing and virtual, bio- and digital- instrumentation. It houses extensive experimental and simulation facilities for instrumentation-related laboratory courses of undergraduate students of IIST. Research projects related to design and implementation and analysis of magnetic sensors and interface electronics, direct digitizers, advanced measurement circuits, biomedical electronics and embedded systems are also carried out in this laboratory.

18 MEMS and NanoFAB Lab

- **Floor area:**
- **Overall capital expenditure:**
- **Major instruments/ equipments:**
- **Objective of the lab:**

19 Navigation systems and Sensors Lab

- **Floor area:**
- **Overall capital expenditure:**
- **Major instruments/ equipments:**
- **Objective of the lab:**

20 NEMS & Microelectronics characterization & NEMS Sensor Systems Lab

- **Floor area:**
- **Overall capital expenditure:**
- **Major instruments/ equipments:**
    - Experimental setups established for Electrical characterization (I-V, C-V, etc.) of Micro/Nanoelectronics devices, NEMS/MEMS using DC Probe station, semiconductor analyzers, SMUs,Digital Multimeter, DSO etc.

- Experimental setups established for Mechanical and electromechanical Characterization thin films, MEMS/NEMS devices VLSI and NEMS sensor systems- Nanoindentation, Microsystem Analyzer, Laser Doppler Vibrometry (LDV), Electrodynamic shaker, semi-automatic force tester/4-point /3-point bending test setup etc.
- Customized experimental setups for electromechanical characterization of MEMS nanomechanical sensors, sensor testing setup for gas and environmental sensing using nanomechanical sensors etc.

- **Objective of the lab:** NEMS & Microelectronics characterization and NEMS Sensor Systems laboratories have been established with characterization/testing equipments with funding support from institute and research projects.

21 NEMS and Sensor Systems Lab

- **Floor area:**
- **Overall capital expenditure:**
- **Major instruments/ equipments:**
- **Objective of the lab:**

22 Operational Ground Station

- **Floor area:**
- **Overall capital expenditure:**
- **Major instruments/ equipments:**
- **Objective of the lab:**

23 Opto Electronics and Photonics Lab

- **Floor area:**
- **Overall capital expenditure:**
- **Major instruments/ equipments:**
- **Objective of the lab:**

24 Power Electronics in Electrical Distribution System Lab (PEDS)

- **Floor area:** 55 sq m
- **Overall capital expenditure:** 56.5 Lakhs
- **Major instruments/ equipments:**
  (1) 3 Phase Auto Transformer (40.4 A)
  (2) 3 Phase Auto Transformer (20 A)
  (3) 1 Phase Auto Transformer (20 A)
  (4) Soldering Station Weller
  (5) Winding Machine ACME
  (6) LCR Meter (Hioki)
  (7) DMM
  (8) DSO (2014Purchased)
  (9) Personal Computer

(10) Rectifer 3 Phase (Semikron)

(11) LCR Meter (Metravi)

(12) DSO Tektronix

(13) Work bench

(14) Table

(15) 1KVA single phase isolation transformer

(16) DSP Board

(17) Current Prob 30 MHz and 10 MHz Keysight

(18) Differential Prob 100 MHz Keysight

(19) Current Prob 100 MHz Keysight

(20) Differential Prob 5 MHz Tektronix

(21) Current Prob Tektronnix 50 MHz

- **Objective of the lab:** Lab is specifically allotted for research activities in Power Electronics programme. Research activities like Phase shifted and resonant converters, SMPS, Grid connected systems and Solid state transformers.

25 Power Electronics PG Lab

- **Floor area:** 60 sq m
- **Overall capital expenditure:** 23.5 lakh
- **Major instruments/ equipments:** Major equipments are DSO, Inverters, Power Supply, 3 Phase and 1 Phase Auto Transformer, Induction Machines, Function Generators, Inductive loads etc.
- **Objective of the lab:** Both teaching and research activities are going on in Power Electronics Lab.M.Tech Students are working in the lab on their Final year Projects.

26 Power Electronics Research Lab

- **Floor area:** 120 sq m
- **Overall capital expenditure:** 2 Crore
- **Major instruments/ equipments:** The major equipment for the Power Electronics Research Laboratory includes:

  1. 6 Phase Induction motor
  2. Permanent magnet synchronous motor with eddy current loading
  3. 5phase 1HP 200V,1440rpm,50Hz Induction Motor: BENN Electricals
  4. Solar PV Grid Tide Training System: Ecosense
  5. Solar PV Training System: Ecosense
  6. Modular Electronic Load

7. Solar array simulator
8. BLDC Motor
9. DC Power Supply: GPS 3303GW Instek
10. Digital Storage Oscilloscope: TPS 2014B, Tektronix
11. Passive Probe: P5120 Tektronix
12. AC/DC Current Probe: A622 Tektronix
13. Modular Solar Array Simulator: E4367A Agilent
14. Function Generator: AFG3022B, Tektronix
15. Thyristor and Motor Control Trainer
16. Digital Multimeter: 177 Fluke
17. Soldering Station: WS51 Weller
18. Function Generator: SFG2104Instek
19. Personal Computer: Infinity BL 1330PC HCL
20. Single Phase Autotransformer: AVC
21. 3Phase Autotransformer: AE
22. 5phase 1HP 200V,1440rpm,50Hz Induction Motor: BENN Electricals.
23. FPGA Board for Power Converter Applications: Xilinx
24. TMS320F28334 Based DSP Board for Power Electronics: Durable Systems.
25. ACE Kits: Dynafusion Technologies
26. 1200V,75A Converter Module: ROIS
27. 1.5Hp 3phase AC Motor: PEC16ACSQ1, VI Microsystems
28. Resistive Load Bank 300V,20A,5PH: Galaxy Electronics
29. 3Phase 415V,20A Inductive Load: VI Microsystems
30. 8 Channel Mixed Signal Oscilloscope: Yokogawa
31. M2 Memory Expansion
32. C8 Internet Storage 7.2GB
33. G4 Power Supply Analysis Function
34. E1 Additional 701939 Probes
35. 100MHz +/- 1400V Differential Probe: Mo.NO-700924, Yokogawa
36. GMC-1 AC/DC Current Probe: Prosys mo.No.-CP35
37. Digital Storage Oscilloscope: Mo.No.DSOX2024A, Agilent
38. True RMS Clamp Meter: Mo.NO.376, Fluke
39. 4.5 Digit Multimeter: Mo.No.287, Fluke
40. Digital Storage Oscilloscope: Mo.No.DSO9104A, Agilent
41. Digital Storage Oscilloscope: Mo.No.DSOX2024A, Agilent
42. 40MHz Differential Probe: Mo.No. GE8100, Pintech
43. Digital Storage Oscilloscope: DSOX3104A Keysight

44. Differential Probe: N2790A Keysight
45. Current Probe: N2893A Keysight
46. Thermal Imager: MO.No.FLK-TIL25, Fluke
47. 1HP BLDC Motor: Mo.No. PEC16BLDCSI, VI Microsystems
48. 1HP Permanent Synchronous Motor: VI Microsystems
49. Programmable Linear DC Power Supply: Mo.No.GPD-3303D, GW Instek
50. TMS320F28335 Based DSP Board for Power Electronics: Durable Systems
51. 3Phase Firing Pulse Controller for SCR: Uday
52. 3 Phase Fully Controlled & Half Controlled Bridge Rectifier Module: Powerlab
53. 1HP 200V 1500rpm DC Shunt Motor: BEC
54. 3phase 4wire 50Hz 10A Autotransformer: VI Microsystems
55. 1HP 180-200V,1500rpm with Proximity Sensor DC Shunt Motor: Powerlab
56. Current Source Inverter: Part No.MD B6CSI 600/415-35F
57. PSIM Simulation Software
58. 3phase Power Quality and Energy Analyser: Mo.No.437-II
59. Ansys Power Electronics and Drive Design Software
60. Soldering Smoke Absorber
61. 3Lens, 5 LED Light Magnifier
62. 3 Phase Fully Controlled & Half Controlled Bridge Rectifier Module: Powerlab
63. 415V, 3Phase 50Hz 4wire Continuously Variable Autotransformer
64. 3phase 415V, 15A per phase Inductive Load: BENN Electricals
65. Single Phase 1KVA 50Hz 240V Isolation Transformer: AE
66. Variable Voltage Autotransformer: Power Lab
67. Split Phase Synchronous Motor: RAMSON
68. 3KVA Three Phase Transformer: Power Lab
69. 1.5KVA Single Phase Transformer: Power Lab
70. Induction Motor: Power Lab
71. Converter Module
72. LCR Meter: Agilent
73. DC Bias Voltage Unit: Agilent
74. IL2000, 4-Terminal Probe: Agilent
75. L2001 Pincher Probe: Agilent
76. SPS-606 Switching DC Power Supply: Agilent
77. 3phase Fully Controlled SCR Based Bridge Rectifier: Power Lab
78. DC Machine: Power Lab
79. Soldering Station: T0053294699N

- **Objective of the lab:**

(1.) To provide hands-on experience with power electronics and related equipment.

(2.) To facilitate research and development in the field of power electronics.

(3.) To support academic coursework and projects in power electronics.

(4.) To enable the testing and validation of new power electronic devices and systems.

27 Power Electronics UG Lab

- **Floor area:** 49 sq m
- **Overall capital expenditure:** 47 Lakhs
- **Major instruments/ equipments:** Digital Storage Oscilloscopes (DSO), DC Regulated Supply (32V, 3A), multimeter, soldering station, rheostat and work bench.
- **Objective of the lab:**

28 RF and Microwave UG Lab

- **Floor area:**
- **Overall capital expenditure:**
- **Major instruments/ equipments:**
- **Objective of the lab:**

29 Soldering & Wiring Lab

- **Floor area:**
- **Overall capital expenditure:**
- **Major instruments/ equipments:**
- **Objective of the lab:**

30 Small-spacecraft Systems and Payload Centre (SSPACE) Lab

- **Floor area:**
- **Overall capital expenditure:**
- **Major instruments/ equipments:** At present the ground station supports UHF/VHF transmit and receive and S-band in receive mode without additional redundancy. IIST ground station in the UHF has been successfully and continuously operated by students for more than 2 years since the launch of InspireSat1 in Feb. 14, 2022. The balloon launches from IIST were also supported by the ground station. Further, IIST also supported space industry startup Dhruva Space in their POEM LEAP-TD mission during January 2024.

  The IIST Ground station started receiving the signals from the spacecraft from the first orbit and has since then been operating the spacecraft for the past year and half. The spacecraft carried two payload Compact Ionospheric Payload (CIP) designed and developed by NCU, Taiwan and Dual Aperture X-ray Solar Spectrometer (DAXSS) designed and developed by Laboratory of Atmospheric and Space Physics (LASP), University of Colorado, Boulder, USA. The IIST team was involved in the mission design and designed and developed two subsystems OBC and EPS. Further, the SSPACE IIST Ground station is the main operational system for downloading telemetry and data from the payloads. The satellite has since its launch collected valuable science data and is being processed by the science community.
- **Objective of the lab:** SSPACE was established for conceptualising, the design and development of small spacecraft systems and for establishing required equipment and facilities. Understanding that space systems is a fast emerging field, the centre aims at creating an R & D environment for knowledge sharing among the faculty members,researchers, students and visiting scientists by collaborating globally with like-minded academic institutions. The growing emerging trend in the use of small satellites and its constellations in the global scenario demand an urgent need of capacity building in the areas of theoretical design, system engineering and realisation of satellite systems.

31 Systems & Networking Lab

- **Floor area:**
- **Overall capital expenditure:**
- **Major instruments/ equipments:**
- **Objective of the lab:**

32 Virtual Reality Lab

- **Floor area:**
- **Overall capital expenditure:**
- **Major instruments/ equipments:**
- **Objective of the lab:**

33 VLSI & Microsystems Design Lab

- **Floor area:** 20 sq m
- **Overall capital expenditure:** 40 Lakhs
- **Major instruments/ equipments:**

  1 IRNSS Simulator,

  2 VCK190 Deep Learning Unit Board,

  3 VCK 5000 data centre acceleration versal card and software

  4 FPGA boards for signal processing applications

  5 High end PCs and Workstations

- **Objective of the lab:** This research lab is focus on designing and implementing efficient hardware accelerators for signal/image processing techniques and deploying it for real time applications. Scholars who are doing research in VLSI signal processing is utilizing this lab for the research purpose which is furnished with most of the lates Digital IC design tools, FPGA design tools and related software required for simulations and comparsions.

Figure 11: Digital Signal processing Lab.

Figure 12: DSP VLSI Research Lab.

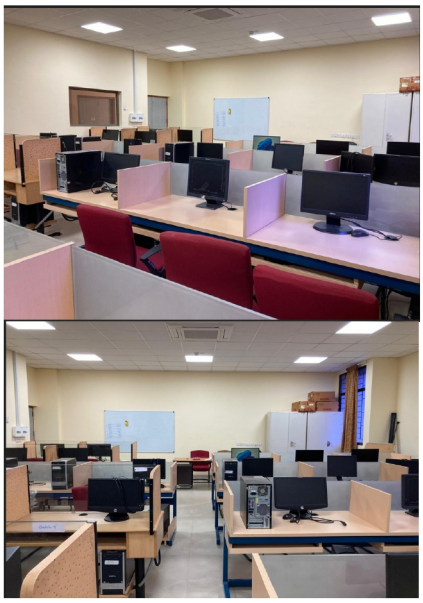

Figure 13: ECAD Lab.

Figure 14: Instrumentation and Measurement Lab.

Figure 15: NEMS & Microelectronics characterization & NEMS Sensor Systems Lab.

Figure 16: Power Electronics PG Lab.

Figure 17: Power Electronics Research Lab.

Figure 18: Power Electronics UG Lab.

Figure 19: Small-spacecraft Systems and Payload Centre (SSPACE) Lab.

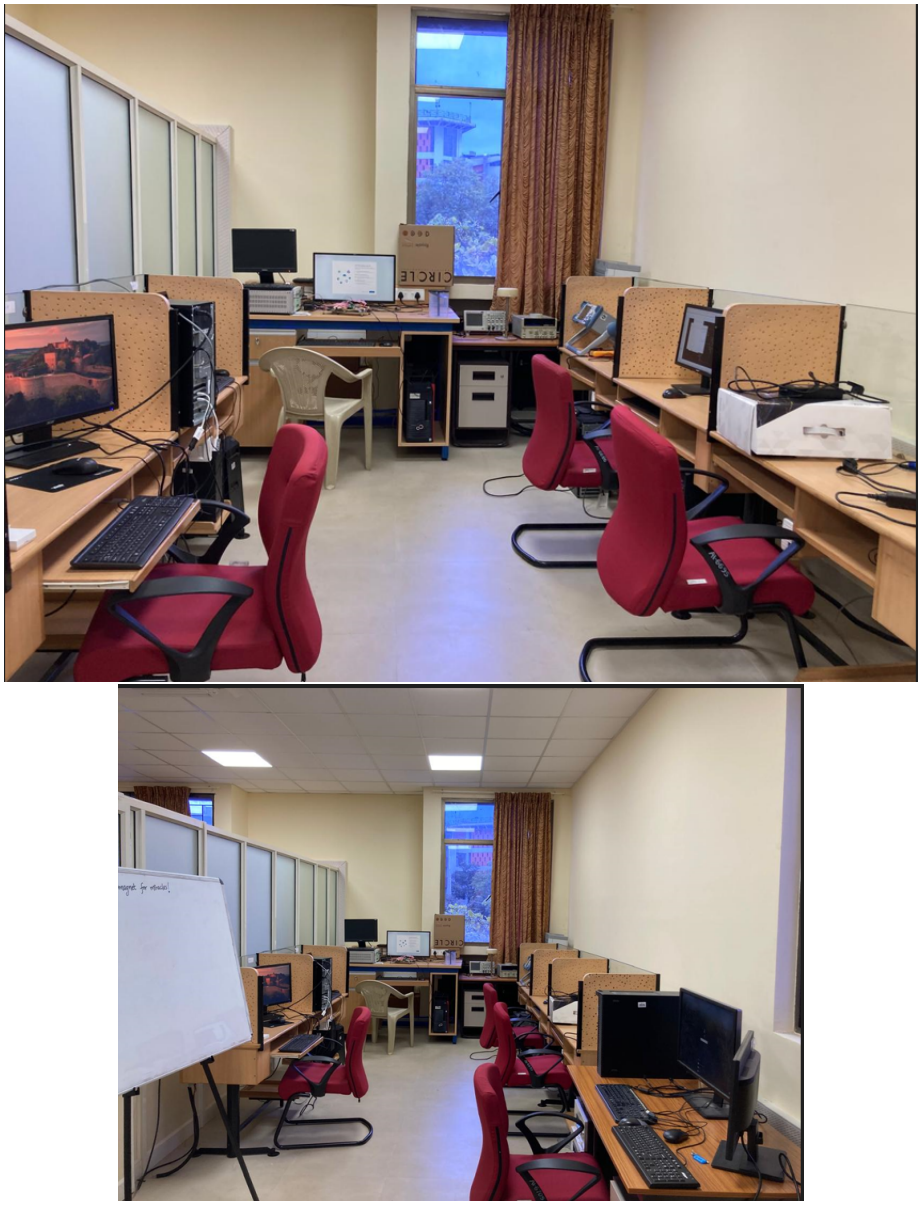

Figure 20: VLSI & Microsystems Design Lab.